SAFETY WATCH

RESPIRABLE SILICA: Health Hazard for Coatings Pros

By Judith Eisenberg, MD and Ron Sollberger, CHMM

Editor's Note: *Whether you are blasting concrete or steel, you must take precautions to prevent exposure to the resulting dust. The silica dust created by both the blasting aggregate and/or the blasted media can have deadly health consequences for those unlucky enough to breathe it. Be safe. Wear a NIOSH-approved respirator when working in these dangerous conditions.*

WHY SHOULD THE COATINGS INDUSTRY BE INTERESTED IN RESPIRABLE SILICA?

Employees in the coatings industry can be exposed to respirable silica while stripping old coatings off cement or other silica-containing surfaces before applying a new coating. This exposure may be high enough to cause lung damage. Both employees and their employers should know about the possible health problems breathing in silica can cause.

WHAT IS RESPIRABLE SILICA?

Silica, an element that makes up about 12% of the Earth's crust, comes in many forms. The most familiar of these is silicon dioxide, otherwise known as sand. There are two main types of silica, amorphous (as in glass) and crystalline. Types of crystalline silica are quartz, cristobalite, and tridymite. Sand, which contains quartz, is a major component of concrete.

Because its silica crystals are too large to inhale, beach sand is not hazardous. However, smaller particles are easier to inhale. Silica particles less than one fifth as wide as a human hair are called "respirable" because, once inhaled, they go deep within the lungs. This kind of silica forms when material containing crystalline silica is blasted, drilled, or cut.

HEALTH EFFECTS FROM SILICA INHALATION

Inhaling respirable silica can cause silicosis, a permanent, sometimes fatal lung disease. In the United States, about 1 million workers are exposed to respirable silica every year, and 200 die from it. Silicosis may result from the long-term inflammation silica crystals cause in the lungs. The immune system tries to remove silica from the body by starting an inflammatory response. This is the body's way of telling the immune system to remove a foreign substance. The immune cells take in the foreign material (such as bacteria) and destroy it. Because cells cannot destroy the silica crystals, they build up

TO GET MORE INFORMATION ABOUT SILICA AND SILICOSIS

Educational materials on respirable silica exposure and silicosis are available to the public on the NIOSH website: www.cdc.gov/niosh/homepage.html or from the toll free number (800) 35-NIOSH. Some of these materials include: *NIOSH Alert: Preventing Silicosis and Deaths from Sandblasting*, published in 1992, NIOSH publication number 92-102; *NIOSH Alert: Preventing Silicosis and Death in Construction Workers*, published in 1996, NIOSH publication number 96-112; *NIOSH Hazard Review: Health Effects of Occupational Exposure to Respirable Crystalline Silica*, published in 2002, NIOSH publication number 2002-129; *Silicosis: Learn the Facts* (this booklet is printed in both English and Spanish), published in 2004, publication number 2004-108. Information on OSHA standards and programs is available at the OSHA website: www.osha.gov.

THE NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH

The National Institute for Occupational Safety and Health (NIOSH), established in 1970 by the Occupational Safety and Health Act, is a research agency within the Centers for Disease Control and Prevention in the Department of Health and Human Services. NIOSH conducts research and provides education in occupational health and safety. Unlike the Occupational Safety and Health Administration (OSHA), which is in the Department of Labor, NIOSH is a non-regulatory agency. NIOSH runs the Congressionally mandated Health Hazard Evaluation (HHE) Program, to check out potential workplace hazards and make recommendations to reduce exposure and prevent disease.

The NIOSH HHE program evaluates new or unusual hazards. NIOSH is interested in evaluating potential employee exposures to respirable silica while stripping old coatings off cement or using silica-containing substrates before applying a new coating. Employers, employee representatives, and employees can request an HHE. You may complete the HHE request online at the NIOSH website: www.cdc.gov/niosh/hhe. You can also find more information regarding the HHE program and HHE request forms on this website. To request paper forms, call the NIOSH toll-free number, (800) 35-NIOSH.

inside the cell. When the immune cell becomes so full of silica it can no longer work properly, it dies. Upon dying, the cell releases the silica crystals back into the lungs. As new immune cells try to remove the silica, the process begins again.

This chronic inflammatory response forms scar tissue. As scar tissue replaces normal lung tissue, shortness of breath, fatigue, and chest pain may occur. Breathing may become so difficult that even walking on level ground is hard. The length of time from first exposure until evidence of silicosis appears depends on the amount and length of silica exposure. It can take 10 to 20 years or longer. The body cannot remove silica, so the disease may progress even after exposure stops because the silica that is already there continues to start an inflammatory response.

Other Health Effects From Silicosis

Silicosis has been associated with rheumatoid arthritis, scleroderma, lupus, and sarcoidosis, and also with various kidney disorders. People with silicosis are at increased risk for developing tuberculosis or similar infections after exposure to these organisms. The cells that usually fight off these bacteria are killed trying to get rid of the silica crystals. Silicosis puts a person at increased risk for lung cancer, as well. Treatment for silicosis consists mainly of supportive care, such as supplemental oxygen, inhaled medications, and periodic tuberculosis testing. Although silicosis has no cure, it is completely preventable. The best defense is never to get silicosis in the first place.

Many employees do not know they have been exposed to hazardous silica on the job. Their physician might not diagnose silicosis when these employees report breathing problems if the physician does not know about the silica exposure. In order for a physician to make a diagnosis of silicosis, the employee must have a history of exposure to respirable silica and a chest x-ray showing markings consistent with silicosis. Lung biopsies showing silica nodules can also be used to make the diagnosis.

Regulatory Requirements Concerning Silica Exposure

In 1996, OSHA published a Silica Special Emphasis Program. This program outlined the sampling methods and medical screening procedure required at any workplace that exposes its employees

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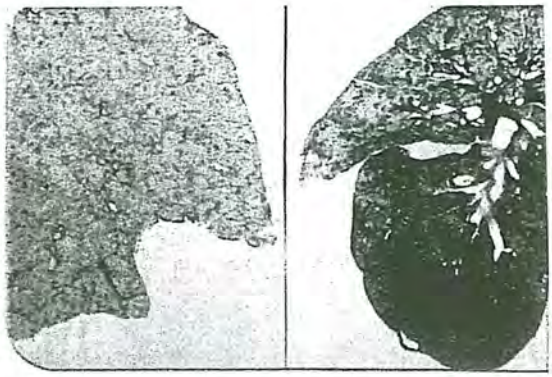

The image on the left shows a section of healthy lung tissue. The image on the right is a section from a silicosis-diseased lung. Silicosis sufferers are at risk for developing many other diseases, including tuberculosis and lung cancer.

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to respirable silica above the Permissible Exposure Limit (PEL). OSHA defines the respirable silica PEL by a formula found in the Construction Standard 1926.55. Each OSHA-approved state plan enforces, at a minimum, the PEL. States may use their own standard as long as it is as stringent as the construction standard PEL. Contractors should contact their state OSHA office to find out how it enforces workplace standards for exposure to respirable silica.

The Special Emphasis Program requires employers to conduct pre-placement medical examinations, lung function testing, and chest x-rays for employees exposed to silica at or above the PEL. These screening tests should be repeated on a regular basis for the duration of employment and when the employee leaves the job. A chest x-ray that is positive or consistent with silicosis requires either immediate participation in a respirator program (including all components described in OSHA 1910.134 such as annual fit testing and training on respirator use, storage, and care), or placement of that employee in a job that doesn't expose them to respirable silica. Employers must keep employee records, including the medical testing results, for 30 years after the employee quits due to the long latency period for silicosis. With silicosis, doctors need to see the changes in the x-rays and lung function testing over time. Early testing helps the doctors to note the small changes that may mark the onset of the disease and to track the course of the disease. Silicosis increases the risk for lung cancer, so periodic chest x-rays may also help detect lung cancer early.

Respiratory Protection Program

Coatings industry employees may be exposed to respirable silica as they strip an old coating off cement-based or other silica-containing products before applying a new coating. When stripping, blasting, drilling, or cutting products that contain silica, employees should wear respiratory protection. In addition, employers should implement a respiratory protection program that conforms to OSHA requirements. Employees exposed to respirable silica should wear, at a minimum, an N-95 half-mask respirator. Full-facepiece air-purifying respirators or powered air purifying respirators with loose-fitting or tight-fitting facepieces may also be used. When selecting respirators, consider ease of use, reuse, disposability, and safety issues. CP

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